# Nicholas Vadivelu - Curriculum Vitae

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**EDUCATION**

*Bachelor of Mathematics*, Computer Science and Statistics (Double Major)
University of Waterloo, Waterloo, ON,
Cumulative GPA: 3.94/4.00
Expected April 2022

**EXPERIENCE**

**Citadel**, *Incoming Quantitative Research Intern* Jun - Aug 2021

**NVIDIA**, *Performance Software Engineering Intern* Aug - Dec 2020
- Reduced BERT/Megatron **inference latency by 30%** through sparsity (C++).
- Open-sourced sparse BERT (Python), the current fastest inference implementation.

**Uber ATG**, *Research Intern* Jan - Aug 2020
- Improved **object detection by 90%** (AP) and **motion forecasting by 22%** (L2) of a self-driving neural net under realistic positional error.
- Published the learned positional error correction system at CoRL (first author).

**Google Brain**, *Research Software Engineering Intern* May - Aug 2019
- Unlocked K-FAC for **over 370,000 users** by implementing and open-sourcing automatic support for arbitrary neural network architectures (Keras).
- Enabled trivial multi-node training with efficient distributed operation placement.
- Designed, created, and open-sourced idiomatic, reproducible training recipes.

**John Hancock Financial**, *Data Science Intern* May - Aug 2018
- Achieved a **fraud detection rate of 63%** by designing an unsupervised ML model.
- Deployed 25 fraud heuristics that **correctly flagged 100+** fraudulent claims.

**RESEARCH**

Advisor(s): **Prof. Martin Lysy, Dr. Lawrence Murray**, Fall 2020
- Research in Sequential Monte Carlo methods for inference on COVID models.

Advisor(s): **Prof. Gautam Kamath**, Fall 2020
- Research in computationally efficient differentially private SGD.

Advisor(s): **Prof. Pascal Poupart**, Fall 2020
- Research in practical second-order methods for neural network optimization.

**PUBLICATIONS**

**Nicholas Vadivelu**, Mengye Ren, James Tu, Jingkang Wang, Raquel Urtasun. Learning to Communicate and Correct Pose Errors. In *Conference on Robot Learning (CoRL)*, Virtual, 2020.

Pranav Subramani, **Nicholas Vadivelu**, Gautam Kamath. Enabling Fast Differentially Private SGD via Just-in-Time Compilation and Vectorization. In *NeurIPS PPML Workshop*, Virtual, 2020.

**SOFTWARE**

**ShapeCheck:** Framework agnostic runtime array checking library.

**JAX ResNet:** Composable, unit-tested code and checkpoints for ResNet variants.

Contributed to: TensorFlow, PyTorch Ignite, Optax, Flax.

**LEADERHIP**

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| **Math Faculty**, *Peer Mentor* | Jan 2021 - Present |
| **Tech+**, *Mentor* | Jan 2019 - Present |
| **UWaterloo Data Science Club**, *Lecturer* | Sep 2018 - Present |
| **Hack the North**, *Mentor/Workshop Lead* | Sep 2018, 2019 |
| **WATonomous**, *Computer Vision Developer* | Sep 2017 - Apr 2018 |

**AWARDS**

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| President's Research Award ($1500) | 2020 |
| David Shepherd Upper-Year Scholarship in Mathematics ($5000) | 2019 |
| President's Research Award ($1500) | 2019 |
| Faculty of Mathematics Scholarship ($5000) | 2018 |
| University of Waterloo President's Scholarship of Distinction ($1500) | 2018 |
| Fahd Ananta Fellowship Award in Computer Science ($200) | 2017 |

**TALKS**

Clustering for Image Analysis (with Kanika Chopra). *WiSTEM High School Student Conference*, Feb 2021.

Establishing a Productive ML Workflow. *Hack the North++*, Jan 2021.

Interactive Data Visualization with Altair. *Hack the North++*, Jan 2021.

Overview of Data Science and Data Science Careers. *UWaterloo Data Science Club*, Aug 2020.

What You See is What You Get: Exploiting Visibility for 3D Object Detection. *Uber ATG Reading Group*, Jul 2020.

Introduction to JAX for Machine Learning and More. *University of Waterloo Data Science Club*, Jul 2020.

Stand-Alone Self-Attention in Vision Models. *Uber ATG Reading Group*, Apr 2020.

Neural Network Optimization Methods. *Reading Group*, Dec 2019.

Introduction to Neural Networks in TensorFlow 2.0. *Laurier Developer Student Club*, Nov 2019.

Introduction to Machine Learning with Scikit-learn. *Hack the North*, Sep 2019.

Introduction to Data Cleaning with Pandas. *Hack the North*, Sep 2019.